



San Diego Municipal Code
Land Development Code

**Calculating
Affordable Housing
Parking Requirements**



This information or this document (or portions thereof) will be made available in alternative format upon request.

Affordable Housing Parking

The following amendments have been incorporated into the posting of this plan:

Amendment	Date Effective Administratively	Date Adopted by City Council	Resolution Number
Initial Adoption	---	__-__-2012	R-__

TABLE OF CONTENTS

INTRODUCTION.....	1
SECTION 1: INPUT DATA SOURCES	2
SECTION 2: SCORE DETERMINATION AND DATA PROCESSING	3
2.1 DERIVING THE WALKABILITY INDEX	3
2.2 DERIVING THE TRANSIT INDEX	6
2.3 DERIVING THE WALKABILITY/TRANSIT INDEX	9
2.4 NOTES FOR GIS USERS	9
APPENDICES	11
A. REFERENCES.....	11
B. AFFORDABLE HOUSING PARKING WORKSHEET	12

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INTRODUCTION

This manual discusses the requirements, assumptions, data sources, and methods used to determine the land use index and transit availability index associated with the development of affordable housing units. These indices are revealed by evaluating “neighborhood–level variables” such as proximity to commercial, office, and institutional uses; and proximity to transit and transit levels of service. The details of the variables and how proximity is determined is detailed in this manual.

The processes outlined here were adapted from the San Diego Affordable Housing Parking Study (December 2011) which determined relationships between transit and land use indices and parking demand for existing affordable housing sites. The purpose of this manual is to assist in determining the indices for new affordable housing units within the City of San Diego. A few variables and operations used in the study have been refined to provide more accurate calculations.

Many of the processes for deriving the land use and transit indices examine spatial relationships among the input data sets. These spatial analysis processes are typically performed using Geographic Information Systems (GIS) software. The viewing and processing of geographic information requires some level of expertise to operate the software and execute the various overlay operations described in this manual. The intent here is to describe the processes in general terms, however, some of the GIS operation terms may be specific to GIS or specific to Esri ArcGIS software which may change over time or may vary with other software applications. The testing and execution of these processes were done using Esri ArcGIS version 10.0 (Build 3600).

SECTION 1: INPUT DATA SOURCES

Neighborhood-level variables are derived from the most current available GIS data layers including Assessor Parcels, Existing Land Use, and Transit Routes and Stops. These data inputs are GIS-based data layers that can be downloaded from the [San Diego Regional GIS Data Warehouse](#). Table 1 outlines the pertinent information from each layer used to determine the indices scores, but may not be all inclusive.

It is highly recommended that users thoroughly read the metadata for each input layer prior to executing any of the processes outlined in this manual. Certain assumptions and limitations may exist for each layer and it is the user's responsibility to understand and use properly the data layers listed below.

TABLE 1

Intent/ Purpose	Input Layer Name (General)	Download (Esri shapefile)	Fields (Field1, Field2, etc.)	Source	Metadata
PS	Parcels	Parcels	APN	SanGIS	Parcels Metadata
TA	Transit Routes	Transit Routes	MODE, PKFREQ, DESC	SANDAG	Transit Route Metadata
TA	Transit Stops	Transit Stops	MODE	SANDAG	Transit Stops Metadata
LU	Current Land Use	Current Land Use	LU, DESC	SANDAG	Current Land Use Metadata

PS = Project Site, TA = Transit Availability, LU = Land Use

SECTION 2: SCORE DETERMINATION AND DATA PROCESSING

2.1 DERIVING THE WALKABILITY INDEX

2.1-1 Summary

The Walkability Index is determined through a proximity analysis that identifies the number of activity-generating land uses (commercial, retail, office, civic, educational, and institutional uses) that are within a ½ mile radius of a development that includes affordable housing units as defined in Section 142.0527. These activity-generating land uses are identified in the Current Land Use data layer and categorized into two types; “Retail” and “Institutional/ Office/ Civic”. A separate search and tally is examined for the two types and the results are represented in a 4-point land use activity index using the following criteria. The specific retail activity-generating uses are identified in Table 2 and the institutional/office/civic uses are identified in Table 3. One point is assigned for each of the following criteria that apply to the project for a maximum possible score of four points.

Retail:

- Project site has between 0 and 120¹ Retail parcels within ½ mile.
- Project site has more than 120¹ Retail parcels within ½ mile.

Institutional/Office/Civic:

- Project site has between 0 and 50² Institutional/Office/Civic parcels within ½ mile.
- Project has more than 50² Institutional/Office/Civic parcels within ½ mile.

2.1-2 Detailed Methods

The proximity analysis used to determine the index scores should follow a specific process for a consistent outcome each time. However, it is important to note that the input data layers identified above are not static layers and are expected to be updated by the source agencies on a regular basis. Therefore, variations in the indices score may result over time. Refer to the metadata for update frequencies.

The following is a process flow for the proximity analysis used to determine the walkability index. As stated previously, these procedures rely on Geographic Information Systems (GIS) software and refer specifically to GIS operations.

¹ 120 was the mean number of Retail parcels identified in the Affordable Housing Parking Study which examined 290 existing affordable housing project sites.

² 50 was the mean number of Institutional/Office/Civic parcels identified in the Affordable Housing Parking Study which examined 290 existing affordable housing project sites

Input Layers Required:

- Parcels
- Current Land Use

Preprocessing:

The inputs layers are relatively large datasets which can dramatically increase processing times. It is recommended that the input layers be clipped to an area approximately 1 mile around the project site. This will increase the performance of the steps below and decrease potential system failures.

Geo-processing:

Note: Sspecific GIS operations are underlined

1. Reduce the visible fields (columns) on the Parcel layer to display only the PARCELID field. It is not necessary to permanently delete, simply turn off the other fields.
2. Using the Parcel layer, select the desired project parcel.
3. Create a new point layer using the centroid of the selected parcel. Select the “inside” option when running the Feature to point tool.
4. Create a ½ mile (2,640 feet) project buffer around the parcel centroid.
5. Select by location all Parcels and Current Land Use areas that intersect the ½ mile project buffer.
6. Using the Clip function, extract the Parcels and Current Land Use from step 5 using the project buffer as the clip feature. These will require 2 separate processes.
7. Convert to points the clipped parcel output layer. Select the “inside” option when running the Feature to point tool.
8. Dissolve the output parcel point layer from step 7 using the PARCELID column as the “Dissolve” field. This will generate a unique point to represent each single parcel area and eliminate those overlapping parcel features that are “stacked” to identify condo ownership.
9. Intersect the points from step 7 with the clipped land use layer. The result should be a point layer of parcel centroids with the land use codes from the Current Land Use.
10. Add a Field to the output from step 8 with the name of “LU_Type”. Field type = Text and Length = 50
11. Select by Attributes all records that contain an LU Code listed in Table 2. The LU Code may have the table field “lu”.
12. Calculate LU_Type to “Retail”
13. Select by Attributes all records that contain an LU Code listed in Table 3.
14. Calculate LU_Type to “Institutional/Office/Civic”
15. Clear all Selected features.

Note: The remaining processes do not require GIS software as they do not involve any overlay/proximity evaluations. If desired, other standard spreadsheet or statistical programs can be utilized. However, the remaining steps explain how to process with GIS software.

16. Generate a summary table to determine the number of parcels within the project buffer based on each land use type. Deploy the Summary Statistics tool. Input features should be the output from steps 8-14. The statistic field is PARCELID with the statistic type as COUNT. The case field in this operation is LU_Type.

Note: The last calculations are to incorporate the 4-point land use activity index based on the results from step 14.

17. Add a field to the output from step 14 with the name of “LU_Index”. Field Type = Short Integer.
18. Calculate LU_Index equal to 1 for all records. A score of 1 is the minimum based on the 4-point land use activity index described in the Summary (Section 2.1-1).
19. Calculate LU_Index separately for each LU_Type based on the 4-point land use activity index formula described in the Summary (Section 2.1-1).

TABLE 2

LU Code	Description	Category
5002	Regional Shopping Center	Retail
5003	Community Shopping Center	Retail
5004	Neighborhood Shopping Center	Retail
5005	Specialty Commercial	Retail
5007	Arterial Commercial	Retail
5009	Other Retail Trade & Strip Commercial	Retail

TABLE 3

LU Code	Description	Category
6001	Office (High-Rise)	Office
6002	Office (Low-Rise)	Office
6003	Government Office/Civic Center	Civic
6103	Library	Civic
6104	Post Office	Civic
6109	Other Public Services	Civic
6509	Other Health Care	Office
6804	Senior High School	School
6805	Junior High School or Middle School	School
6806	Elementary School	School
6807	School District Office	Office
6809	Other School	School
7210	Other Recreation - High	Civic
7601	Park - Active	Civic

2.2 DERIVING THE TRANSIT INDEX

2.2-1 Summary

The evaluation of approximate peak hour transit trips in the vicinity of project sites makes use of a regional transportation coverage network, known as “RTCov”. This file is authored by the San Diego Association of Governments (SANDAG) and contains routes for bus and light rail as well as the stop locations associated with these routes. The Transit Index examines the frequency of transit stop occurrences around a project site, but due to the nature of the source data, it is necessary to associate the transit routes - which hold the frequency parameter - with the stops which are used to identify stops near project sites. Since, particularly in the case of light rail lines, a transit route may pass in the vicinity of a project without actually stopping it is necessary to associate routes and frequencies to stops.

For each project site, the number of peak hour trips is summarized by each route that has at least 1 stop in the project vicinity. In other words, if multiple stops on one route are identified to be within the vicinity, the frequency does not multiply for each stop and only the highest frequency (if the route frequency varies) is evaluated for that project.

As mentioned above the RTCOV layers contain both light rail and bus routes and their associated stops. The proximity parameters for the transit index are ½ mile for light rail and ¼ mile bus. With that said, the below detailed processes are similar in nature but should be processed separately. This is especially necessary due to the proximity distances for light rail and bus – ½ mile and ¼ mile respectively.

The results from this routine will be used to determine the Transit Index based on the total number of peak hour rail or bus transit trip/hour available to a project site. Below is the 4-point scoring method for the Transit Index:

- 1 point - Project site has between 0 and 15 peak hour rail or bus transit trips/hour.
- 2 points - Project site has between 16 and 30 peak hour rail or bus transit trips/hour.
- 3 points - Project site has between 31 and 45 peak hour rail or bus transit trips/hour.
- 4 points - Project site has over 45 peak hour rail or bus transit trips/hour.

2.2-2 Detailed Methods

The proximity analysis used to determine the transit index scores should follow a specific process for a consistent outcome each time. However, it is important to note that the input data layers identified above are not static layers and are expected to be updated by the source agencies on a regular basis. Therefore, variations in the indices score may result over time. Refer to the metadata for update frequencies. Below is a process flow for the proximity analysis used to determine the transit availability index. As stated previously, these procedures rely on Geographic Information Systems (GIS) software and refer specifically to GIS operations.

Input Layers Required:

- Parcels
- Transit Routes
- Transit Stops

Preprocessing:

The inputs layers should not require preprocessing.

Geo-processing:

Note - specific GIS operations are underlined

1. Using the Parcel layer, select the desired project parcel.
2. Create a new point layer using the centroid of the selected parcel. Select the “inside” option when running the Feature to point tool.

3. Create 2 project buffers of ¼ mile (1,320 feet) and ½ mile (2,640 feet) around the parcel centroid. Note, the ½ mile buffer should cover the ¼ mile. Do not create a multi-ring buffer which in some cases can exclude the inner ¼ mile for the ½ mile area.
4. Separate both the routes and stops into “light rail” and “bus” layers. This can be achieved by using the MODE field to select pertinent features followed by a copy or export to new layers. The following criteria should be used to differentiate Light Rail from Bus.
 - i. Light Rail – MODE = 4 or 5
 - ii. Bus = MODE = 8 or 9 or 10

Note: Process steps 5-7 below assign transit routes from step 4 to transit stops in order to evaluate the unique peak frequency from the routes based on stop locations for each project site.

5. Dissolve the route layers for light rail and bus separately based on the transit route number (“ROUTE”) field and by peak frequency (“PKFREQ”) field. Do not select an option for Statistics, leave this blank.
6. Buffer the dissolved output layers from step 5 by 25 feet. Select the option to make the ends flat as opposed to round.
7. Intersect the bus stops points with the buffered bus routes from step 6 and Intersect the light rail stops points with the buffered light rail routes from step 6.
8. Intersect the resultant point layers from step 7 with the pertinent project buffer areas - 1/4 mile for bus stops and ½ mile for light rail stops.

Note: The remaining processes apply to both the light rail and bus route information and should be applied to both as separate processes.

9. Using the results from step 8, generate a summary table for each route maintaining the max peak frequency. Using the Summary Statistics function, input the peak frequency field (“PKFREQ”) as the statistics field with “MIN” as the statistics type and choose the route number (“ROUTE”) for the case field. “MIN” is used for the highest frequency due to lower numbers representing the number of minutes between each stop.

Note: The remaining processes do not require GIS software as they do not involve any overlay/proximity evaluations. If desired, other standard spreadsheet or statistical programs can be utilized. However, the remaining steps explain how to process with GIS software.

10. Add a Field to each of the outputs from step 9 with the name of “Trips_per_hr” Field type = Long Integer.
11. Calculate “Trips_per_hr” by dividing 60 by the max peak frequency for each route/stop layer generated in step 8. The outcomes here represent the trips per peak hour for each route in the project vicinity. (e.g. 60 / [MIN_PKFREQ])

12. Determine the sum of the trips per hour for each route by adding them together.
13. From step 12, add the sums for light rail and bus together and this will be your total score to be used to determine the transit availability index score.

2.3 DERIVING THE WALKABILITY/TRANSIT INDEX

The Walkability/Transit Index score is determined by adding the Walkability Index and the Transit Index and dividing the sum by two. The Walkability/Transit Index score will be a number between 0 and 4. Identify which of the following score ranges accommodate the project's Walkability/Transit Index score to determine the parking demand.

- 0.0 - 1.99 High parking demand
- 2.0 - 3.99 Medium parking demand
- 4.0 Low parking demand

Use the Affordable Housing Parking Worksheet (Appendix B) to calculate the required number of parking spaces.

1. First identify the type of affordable housing project (family, SRO, Senior, studio & 1 bedroom, or special needs).
2. Provide the information requested in row 1 for the total number of units and the number of units based on size (studio/bedrooms).
3. Calculate the number of parking spaces using the ratios for high, medium, or low (row 2) as determined by the Walkability/Transit Index.
4. Calculate the number of spaces required for staff parking, visitor parking, and assigned/non-assigned parking.
5. Combine the total parking spaces from step 3 and step 4 for the required number of parking spaces.

2.4 NOTES FOR GIS USERS

Many of the processes for deriving the transit and land use indices examine spatial relationships among the input data sets. These spatial analysis processes are typically performed using Geographic Information Systems (GIS) software. The viewing and processing of geographic information requires some level of expertise to operate the software and execute the various overlay operations described in this manual. The intent here is to describe the processes in general terms, however, some of the GIS operation terms may be specific to GIS or specific to Esri ArcGIS software which may change over time or may vary with other software applications.

Although GIS is a tool with robust functionality, the results it yields are wholly dependent on the input data. In the case of the variables discussed here, uniform GIS data (data spanning the entire city of San Diego) on current land uses and transit services) is

limited to the best available information available to perform these site evaluations. The outputs of the analysis are thus constrained by how and when these input data layers were developed and how their attributes were coded. For example, the "peak frequency" of bus trip recorded is a representation of how SANDAG chose to record peak frequencies of a particular bus line when they developed the "RTCov" dataset. It is therefore advised to always refer to the metadata to determine if the variables and data values are consistent with the processes described above.

The testing and execution of these processes was done using Esri ArcGIS version 10.0 (Build 3600). This software and specific version is not a requirement for executing the processes described above.

APPENDICES

A. REFERENCES

[San Diego Affordable Housing Parking Study](#)

[ArcGIS 10 Resource Center and Help](#)

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B. AFFORDABLE HOUSING PARKING WORKSHEET

Project Description & Criteria		A. Total Units	B. Studio H/M/L	C. 1 BR H/M/L	D. 2 BR H/M/L	E. 3 BR H/M/L	F. Subtotal (Σ B3 - E3)	G. Visitor Parking (G2 x A1)	H. Staff Parking (H2x A1)	I. Total without Assigned Parking (Σ F3 -H3)	J. Total with Assigned Parking (I3 x J2 + I3)
Family Housing	1.Units										
	2.Rate		N/A	1.0/0.6/0.33	1.3/1.1/0.5	1.75/1.4/0.75		0.15	0.05		0.1
	3.Spaces										
SRO	1.Units										
	2.Rate		0.5/0.3/0.1	N/A	N/A	N/A		0.15	0.05		0.1
	3.Spaces										
Senior Housing	1.Units										
	2.Rate		0.5/0.3/0.1	0.75/0.6/0.15	1.0/0.85/0.2	N/A		0.15	0.05		0.1
	3.Spaces										
Studio & 1 Bdrm.	1.Units										
	2.Rate		0.5/0.2/0.1	0.75/0.5/0.1	N/A	N/A		0.15	0.05		0.1
	3.Spaces										
Special Needs	1.Units										
	2.Rate		0.5/0.2/0.1	0.75/0.5/0.1	N/A	N/A		0.15	0.10		0.1
	3.Spaces										

H- High parking Demand

M - Medium parking demand

L - Low parking demand